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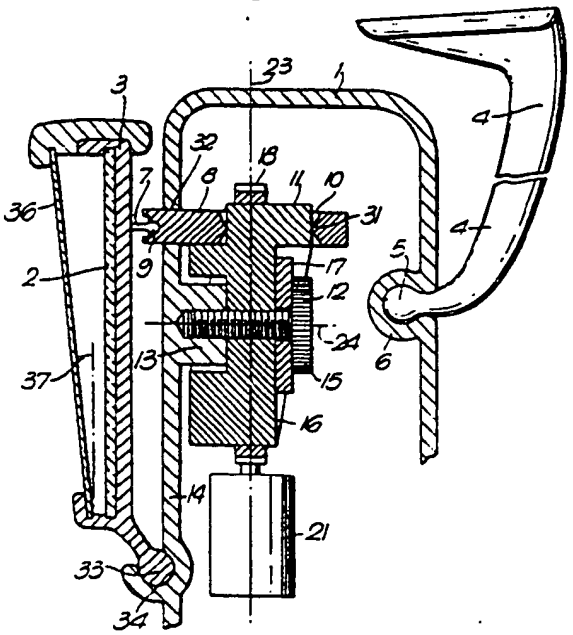
## (54) Rear view mirror.

(57) The present invention provides a rear view mirror for a motor vehicle which is automatically adjustable to prevent the effects of dazzle eg. by a vehicle approaching from behind at night. The mirror comprises an adjustable mirror surface (2) housed in a casing (3) and connected in an adjustable manner to an actuator (8) which engages an annular cam formation (26) having various cam profile heights whereby the mirror surface (2) can be adjusted by tilting. The cam formation (26) is part of a toothed wheel (11) driven by a small electric motor (21) the control circuit of which is actuated by a photosensor (38) so that mirror tilting is dependent on light intensity thresholds. The arrangement enables the@various mirror adjustments to be achieved using uni-directional rotation of the motor and the toothed wheel (11) and this has the advantage of providing more reliable operation with less noise. The present adjusting mirror is also relatively inexpensive to manufacture.

Fig.1.

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# "REAR VIEW MIRROR"

This invention relates to a rear view mirror for vehicles with an adjustable mirror surface to prevent the effects of glare.

Rear view mirrors with a mirror surface which is automatically adjusted by an electric motor in conditions of incresed light intensity have become known in various embodiments. There are rear view mirrors in which the mirror surface is tilted in a fixed casing as well as ambodiments in which the casing complete with mirror surface is adjusted vis a vis a bearing arm. However, the embodiments known so far have certain drawbacks with regard to practical use. In particular it appeared that relatively strong motors were required and these created excessive noise. In addition the previous automatic rear view mirrors could not be manufactured at a suitable price.

The object of the present invention is therefore to improve a rear view mirror as described in the introduction in such a way that it is inexpensive to manufacture, is largely maintenance-free and does not wear very easily, while the tilting movement is carried out quietly and within small spacial dimensions.

This problem is solved by the invention in that the mirror surface is adjustably connected to an actuator which is engaged in a cam surface formation, the various profile heights of which correspond to various angles of adjustment in respect of the mirror.

In such a rear view mirror the adjustment of the rear view mirror is carried out before the driver of the vehicle notices the glare. Thus the driver need not let go of the steering wheel of the vehicle in order to manually adjust the mirror to stop the glare. This is particularly dangerous in situations where the driver is already being dazzled through the mirror, as the effect of the dazzle means that the area ahead of the vehicle can no longer be seen clearly enough and manually adjust ing the rear view mirror further distracts the driver from the traffic.

According to a preferred embodiment of the invention, the intensity of the light falling on the mirror is measured by a photoelectric cell. The mirror is then adjusted in accordance with the determined light intensity over a predetermined light intensity threshold value in order to thus prevent the driver being dazzled.

The adjusting movements are preferably carried out with the aid of a toothed wheel which carries the cam surface formation, and are transferred from an electric motor onto the actuator which is connected to a casing containing the mirror surface. The design of the cam formation ensures that the motor need only revolve in the same direction and all toothing of the drive is always engaged. Early wear and undesirable impacts inside the drive can thus be avoided.

The dimensions of the electric motor can be relatively small as it only needs to produce the small amounts of power which are required to overcome bearing friction. Due to the structural design of the connection between the parts which are adjusted in respect of each other the elctric motor need to do hardly any lifting work.

According to a further preferred embodiment of the invention, the light intensity threshold value which causes the rear view mirror to be adjusted can be regulated with the aid of an adjusting wheel. The rear view mirror can therefore be adjusted by drivers to suit various light intensity levels and sensitivities to light.

According to another preferred embodiment of the invention the casing of the rear view mirror is designed in such a way that depending on purpose and availability various sizes of mirror glasses can be inserted into the casing.

Further details of the invention are described in the following with the aid of the attached diagrams which illustrate one preferred embodiment of the invention.

In the drawings :-

Fig. 1 is a schematic view of a rear view mirror with adjusted mirror surface when lighting intensity is strong,

Fig. 2 is a schematic view of a rear view mirror in the unadjusted state when lighting intensity is not strong,

Fig. 3 is a side view of the casing containing the mirror surface,

Fig. 4 is a cross section through the casing along the line IV-IV -in fig. 3.

Fig. 5 is a half top view of the casing in fig. 3,

Fig. 6 is a front view of the main casing.

Fig. 7 is a schematic view of the construction of the casing,

Fig. 8 is a schematic view of the actuator.

Fig. 9 is a top view of the toothed wheel,

Fig. 10 is a side view fo the toothed wheel,

Fig. 11 is a side view of a half cut away toothed wheel,

Fig. 12 is a basic sketch of the electrical switching circuit of the drive motor,

Fig. 13 is a top view of the adjusting wheel,

Fig. 14 is a side view of a half cut away adjusting wheel

Fig. 15 shows a half cut away rear view mirror casing.



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A rear view mirror essentially comprises a main casing 1, a mirror casing 3 containing a mirror surface 2 and also a bearing arm 4. The rear view mirror is fastened to a vehicle (not shown) by means of the bearing arm 4, and specifically above the windscreen within the vehicle. By means of a spherically shaped end piece 5 the bearing arm 4 is arranged in a recess 6 of casing 1. The casing 1 can thus be turned vis a vis the bearing arm 4 which is firmly fixed to the vehicle and can be adjusted according to the various heights and sitting positions of different drivers of the vehicle.

The casing 3 is connected to an actuator 8 by means of coupling projections 7. The coupling projections 7 are rotatingly arranged in recesses 9 of the actuator 8. The actuator 8 has a further recess 10 into which a toothed wheel 11 engages. The toothed wheel 11 is rotatingly arranged in casing 1 and fastened in a guide 13 by means of threaded screw 12. The guide 13 is integral with the forward wall 14 of casing 1. In order to improve the direction of spiral and guiding accuracy of the toothed wheel 11 a disk 17 is provided between the head 15 of the threaded screw 12 and the side surface 16 of the toothed wheel 11 extending parallel to the forward casing wall 14.

Through teeth 18, the toothed wheel 11 engages in a helical thread 19 on the drive axle 20 of a motor 21. Whereby when the motor 21 is supplied with power through leads 22, the toothed wheel 11 rotates. The rotational plane 23 is thereby parallel to the forward casing wall 14. The toothed wheel 11 has a raised cam surface portion 26 in its outer area 25 relative to the axis of rotation 24. The cam portion 26 is such that the outer area zone 25 is the same size i.e. same height over the total circumference of the toothed wheel 11 measured normal from the plane of rotation 23. The surfaces 27, 28 Figs 10, 11 of the outer area zone 25 extending parallel to the plane of rotation 23 vary in distance 29, 30 from the forward casing wall 14 throughout the circumference of the toothed wheel 11 due to the design of the raised cam portion 26.

The cam portion 26 is such that the outer area zone 25 for a quarter of its extent along the circumference of the toothed wheel 11 comprises surfaces 27, 28 at constant distances 29, 30 respectively from the forward parallel casing wall 14. In the remaining portion of outer area zone 25 the distance of the surfaces to the casing part 14 continually increases or decreases.

The actuator 8 is guided by virtue of points 31 acting on the surfaces 27, 28 and the intermediate rising and falling surface parts. In addition the actuator 8 is further guided in a slit 32 in the casing wall 14. Due to the rotating movement of the toothed wheel 11 the actuator 8 is mvoed normally towards or away from the forward casing part 14 through the slit 32 in accordance with the course of the cam portion 26.

Due to the coupling 7, 9 of the casing 3 with the actuator 8, the casing 3 in the area of the coupling projections 7 is at varying distances from casing 1. In addition casing 3 is adjustably guided in recesses 34 of the forward casing wall 14 by means of rounded coupling parts 33. Because of the geometric arrangement of the coupling parts 7, 33 a movement of the actuator 8 out of the casing 1 brought about as a result of rotation of the toothed wheel 11 causes the mirror surface 2 to be tilted, and the actuator 8 moving into the casing 1 results in the mirror surface 2 moving to a more vertical position. When the mirror surface 2 is in the normal position shown in fig. 2, the mirror surface 2 is at an angle to the casing wall 14. If the actuator 8 has been moved into casing 1 through rotation of the toothed wheel 11, the mirror surface 2 extends parallel to the wall 14 with the cam portion 26 at a maximum distance 30 from the casing wall 14. If the mirror had previously been adjusted so that the driver could observe following traffic due to the mirror effect, the light falling on the mirror surface is now reflected onto an area of the vehicle roof. However, so that the driver is also able to obtain information about the following traffic when the mirror surfacd is in this position, a glass sheet 36 is additionally provided in casing 3. In contrast to the mirror surface 2 the glass sheet is adjusted at a fixed angle 37, which is equal to the maximum angle of adjust ment 35 between mirror surface 2 and casing wall 14. When the rear view mirror is in the position shown in figure 1 the glass sheet 36 is therefore at the same angle with respect to the casing wall 14 as the mirror surface 2 is in fig..2. As the glass surface also has reflective properties either the intensively reflected light from the mirror surface 2 reaches the driver's eyes, or the driver can obtain information about the following traffic through the considerably weaker image reflected from the surface of the glass sheet 36 when the rear view mirror is in the adjusted position.

Adjustment to the angle 35 is always useful whenever the driver is being dazzled by following traffic or when the sun is low in the sky behind the vehicle. The intense light falling on the rear view mirror in such conditions is measured by means of a photosensor 38 which is located in the casing 1 behind an aperture 39. Referring to Fig. 13 the intensity of the light falling on the photosensor 38 can be regulated by means of a screen 40 provided with a slit 41. The slit 41 is formed in such a way that in an area 42 of its length it is adapted to the rounded shape of the aperture 39 but with a

larger cross-section than the latter. In an area 43 the slit is formed in such a way that it tapers away from the area 42 to end in a point. The screen 40 is part of an adjusting wheel 44 which rotatably arranged in casing 1 and a section of the circumference 46 of which projects out of the casing 1 through an opening 45. Area 46 of the adjusting wheel 44 is knurled 47 which facilitates the driver to turn the adjusting wheel 44 and thereby regulate the amount of light falling on the photosensor 38. The knurling 47 significantly improves the transfer of force from the driver's finger to the adjusting wheel 44 compared with a smooth design of area 46.

The adjusting wheel 44 also has notches 48. In respect of the notches 48 casing 1 has a stopper 49 which engages in the notches 48. When the adjusting wheel 44 is turned the stopper 49 exerts a force on the adjusting wheel 44 which on the one hand opposes the turning force and on the other hand has a component which is directed towards the mid-point of wheel 44. Between the notches 48 and its mid-point the adjusting wheel 44 has a relief slit 50. The force component acting on the mid-point of the adjusting wheel elastically compresses the adjusting wheel 44 in the area of the relief slit 50 and therefore the adjusting wheel 44 can be turned past the stopper 49 and is nevertheless fixed in an adjustable position without the effects of external forces.

At the beginning and end of the notches 48 the adjusting wheel has two cams 53. These cams 53 limit together with the stopper 49 the rotation of the adjusting wheel 44 in its end position. In one direction of rotation the end position is reached when area 42 of the screen slit 41 is over the aperture 39 allowing maximum light to pass through. In the other direction of rotation the end position is reached when screen 40 completely covers aperture 39. In the latter position a switching cam 51 on the adjusting wheel 44 switches off the power supply of a threshold switch 55 (see Fig. 12) via an alternating switch 52 and the rear mirror is returned to its resting position by means of lead 60. The alternating switch 52 is preferably a microswitch.

The power supply can be provided by a vehicle battery 54 in which the power is taken from the circuit for the vehicle interior lighting. It is however also conceivable to provide a separate battery or accumulator which is preferably arranged in casing 1. The accumulator could for example be charged by means of solar cells.

The light falling on the photosensor 38 affects the power into the threshold switch 55. Over a certain light intensity the power is so great.that the threshold switch 55 produces a control signal which is led via lead 57 and alternating switch 59 to a switch amplifier 56. The switch amplifier 56 processes this signal and controls a motor 21 via leads 22.

The thus controlled motor 21 causes the toothed wheel 11 to rotate. The opposing forces produced by the motor 21 driving the toothed wheel 11 are transferred onto members 63 of casing 1 through pins 61 which project out of both casing shields 62 of motor 21. The pins 61 are located in recesses 64 of the members 63. In addition the casing 65 of the motor 21 is adjacent to further members 66 of casing 1.

When the toothed wheel 11 rotates, the actuator 8 is pulled into casing 1. Due to the form of the recess 32 it is guided vertically to the forward casing wall 14. The toothed wheel 11 rotates until one of the switching cams 67 on the toothed wheel 11 switches over the switch 59. Switch 59 is now connected with lead 58. The switching cam 67 is arranged on the toothed wheel 11 in such a way that the motor power is interrupted when the drive points 31 of the actuator 8 are guided in the centre of area 25 of the toothed wheel 11 extending parallel to the forward casing wall at distance 30. The driver is now able to observe the traffic following him by means of the weak image reflected from the surface of the glass sheet 36.

When the intensity of the light falling on the rear view mirror decreases, the threshold switch 55 reverts to its original position below a certain light intensity. This causes a control signal to be produced on lead 58 which reaches the switch amplifier 56 via the alternating switch 59 which is still in its other position, and the switch amplifier controls the motor 21. Rotation of the toothed wheel 11 is continued and the actuator 8 is pushed out of the casing 1. Rotation of the toothed wheel 11 is interrupted when another switch cam 69 located on the toothed wheel 11 switches the alternating switch 59 back into its other position and thereby breaks the connection between lead 58 and switch amplifier 56.

Through an appropriate adjustment of the screen 40 the driver can adopt the brightness, which causes the rear view mirror to tilt, to the external lighting conditions and his own sensitivity to light. If the surrounding lighting conditions are bright only very great light intensity should cause the rear view mirror to tilt. In conditions of darkness the mirror should tilt even in weaker light as otherwise a strong dazzle effect will occur.

Both the casings 1 and 3 can be made either of metal of synthetic material and the bearing arm 4 also can be made of such materials. It would be possible to have the casings 1 and 3 combined in a single integral casing.

## Claims

1. A rear view mirror for a vehicle with an adjustable mirror surface to prevent the effects of dazzle, characterised in that the mirror surface (2) is connected in an adjustable manner to an actuator (8) which is engaged in a cam surface formation (26) the various profile heights of which correspond to various angles of adjustment in respect of the mirror.

2. A rear view mirror according to claim 1, characterised in that the cam surface formation (26) is part of a toothed wheel (11).

3. A rear view mirror according to claim 2, characterised in that the toothed wheel (11) is arranged in a revolving manner in a forward casing wall (14) by means of a threaded screw (12).

4. A rear view mirror according to claim 3, characterised in that the rotational plane of the toothed wheel (11) is plane-parallel to said forward casing wall (14).

5. A rear view mirror according to claim 4, characterised in that the cam formation (26) is adjacent to an outside area (25) of the toothed wheel (11) both on the side facing the casing wall (14) and on the side facing away from the casing wall (14).

6. A rear view mirror according to claim 5, characterised in that the cam formation (26) is formed in such a way that on the side of the outer area (25) facing away from the casing wall (14) it extends for a quarter of the circumference of the toothed wheel (11) at a first distance (30) to the casing wall (14) and parallel thereto.

7. A rear view mirror according to claim 6, characterised in that the cam formation (26) is formed in such a way that on the side of the outer area (25) facing away from the casing wall (14) it extends for a quarter of the circumference of the toothed wheel (11) at a second distance (29) to the casing wall different from said first distance (30) and parallel to the casing wall (14).

8. A rear view mirror according to claim 7, characterised in that the cam formation (26) is formed in such a way that on the side of the outer area (25) facing away from the casing wall (14) it continuously rises and falls between the parts (27, 28) parallel to the casing wall (14).

9. A rear view mirror according to claim 1, characterised in that a sheet of glass (36) is contained within the mirror casing (3).

10. A rear view mirror according to claim 9, characterised in that the sheet of glass (36) is at an angle (37) to the mirror surface (2).

11. A rear view mirror according to claim 2, characterised in that a motor (21) located in a main casing (1) drives the toothed wheel (11) by means of a drive shaft (20).

12. A rear view mirror according to claim 11, characterised in that the motor (21) is connected to a power source (51) by means of a circuit (22) having a switch (52).

13. A rear view mirror according to claim 12, characterised in that a switching cam (51) is provided in order to operate the switch (52) and in that the switching cam (51) is part of an adjusting wheel (44).

14. A rear view mirror according to claim 13, characterised in that the adjusting wheel (44) is arranged to rotate in said main casing (1).

15. A rear view mirror according to claim 13 or 14, characterised in that the adjusting wheel (44) has a screen slit (41).

16. A rear view mirror according to claim 15, characterised in that the screen slit (41) is rounded over a large area (42) and has a larger cross section than an aperture (39) through which light falls onto a photosensor (38).

17. A rear view mirror according to claim 16, characterised in that the screen slit (41) forms a point in a narrow area (43) of its length beginning from the said large area (42).

18. A rear view mirror according to claim 13, characterised in that the adjusting wheel (44) has notches (48) and in that the notches (48) are bordered by two cams (53).

19. A rear view mirror according to claim 16, characterised in that a photosensor (38) is arranged behind the aperture (39) in the direction of an entering beam of light.

20. A rear view mirror according to claim 16, characterised in that the photosensor (38) is connected to a threshold switch (55).

21. A rear view mirror according to claim 20, characterised in that the threshold switch (55) operates in dependence on the light intensity on the mirror.

22. A rear view mirror according to claim 2, characterised in that the toothed wheel (11) projects into a recess (10) of the actuator (8).

23. A rear view mirror according to claim 22, characterised in that the actuator (8) is guided on the cam formation (26) by means of contact edges (31).

24. A rear view mirror according to claim 3, characterised in that the actuator (8) is guided in a recess (32) in the casing wall (14).

25. A rear view mirror according to claim 1, characterised in that the actuator (8) has recesses (9).

26. A rear view mirror according to claim 25, characterised in that coupling projections (7) of a casing (3) are adjustably arranged in the recesses (9).



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27. A rear view mirror according to claim 26, characterised in that the mirror surface (2) is contained within said casing (3).

28. A rear view mirror according to claim 26, characterised in that said casing (3) has coupling members (33).

29. A rear view mirror according to claim 28, characterised in that the coupling members (33) are adjustably arranged in recesses (34) of casing wall (14).

30. A rear view mirror according to claim 11, characterised in that the drive shaft (20) ends in helical toothing (19), and in that the helical toothing (19) meshes with toothing (18) of the toothed wheel (11).

31. A rear view mirror according to claim 11, characterised in that pins (61) are fixed to casing shields (62) of the motor (21).

32. A rear view mirror according to claim 11, characterised in that the motor (21) is arranged sideways be means of members (66) of the main casing (11) adjoining the motor casing (65).

33. A rear view mirror according to claim 12, characterised in that the power source (54) is a vehicle battery.

34. A rear view mirror according to claim 13, characterised in that the adjusting wheel (44) has knurling (47) in an outer area (46) of its circumference.

35. A rear view mirror according to claim 11, characterised in that a forward casing wall (14) of the main casing (1) has a slit (32) through which the actuator (8) is led.

36. A rear view mirror according to claim 18, characterised in that the notches (48) are adjacent to a stopper (49).

37. A rear view mirror according to claim 36, characterised in that the stopper (49) is part of the main casing (1).

38. A rear view mirror according to claim 33, characterised in that the knurling (46) of the adjusting wheel (44) projects through an opening (45) of main casing (1).

39. A rear view mirror according to claim 31, characterised in that the aperture (39) can be adjustably closed by means of the screen (45) formed by the adjusting wheel (40).

40. A rear view mirror according to claim 20, characterised in that the threshold switch (55) is electrically connected to a switching amplifier (56).

41. A rear view mirror according to claim 40, characterised in that the switching amplifier (56) is electrically connected to a motor (21) by conduit means (22).

42. A rear view mirror according to claim 40, characterised in that the switching amplifier (56) drives a motor (21).

43. A rear view mirror according to claim 41, characterised in that electrical conduits (22) are connected to the switching amplifier (56) via a switch (59).

44. A rear view mirror according to claim 43, characterised in that said switch (59) is an alternating switch.

45. A rear view mirror according to claim 43 or 44, characterised in that said switch (59) is operating by means of switching cams (67, 69) of the toothed wheel (11).

46. A rear view mirror according to claim 11, characterised in that the main casing (1) has a rounded recess (6).

47. A rear view mirror according to claim 46, characterised in that in said recess (6) a rounded end (5) of a bearing arm (4) is guided.

48. A rear view mirror according to claim 47, characterised in that the bearing arm (4) is fastened in an area above a windscreen of a vehicle.

49. A rear view mirror according to claim 47 or 48, characterised in that the bearing arm (4) is made of synthetic material.

50. A rear view mirror according to claim 47 or 48 characterised in that the bearing arm (4) is made of metal.

51. A rear view mirror according to claim 11, characterised in that the main casing (1) is made of synthetic material.

52. A rear view mirror according to claim 11, characterised in that the main casing (1) is made of metal.

53. A rear view mirror according to claim 1, characterised in that the mirror casing (3) is made of synthetic material.

54. A rear view mirror according to claim 1, characterised in that the mirror casing (3) is made of metal.

Fig. 1.

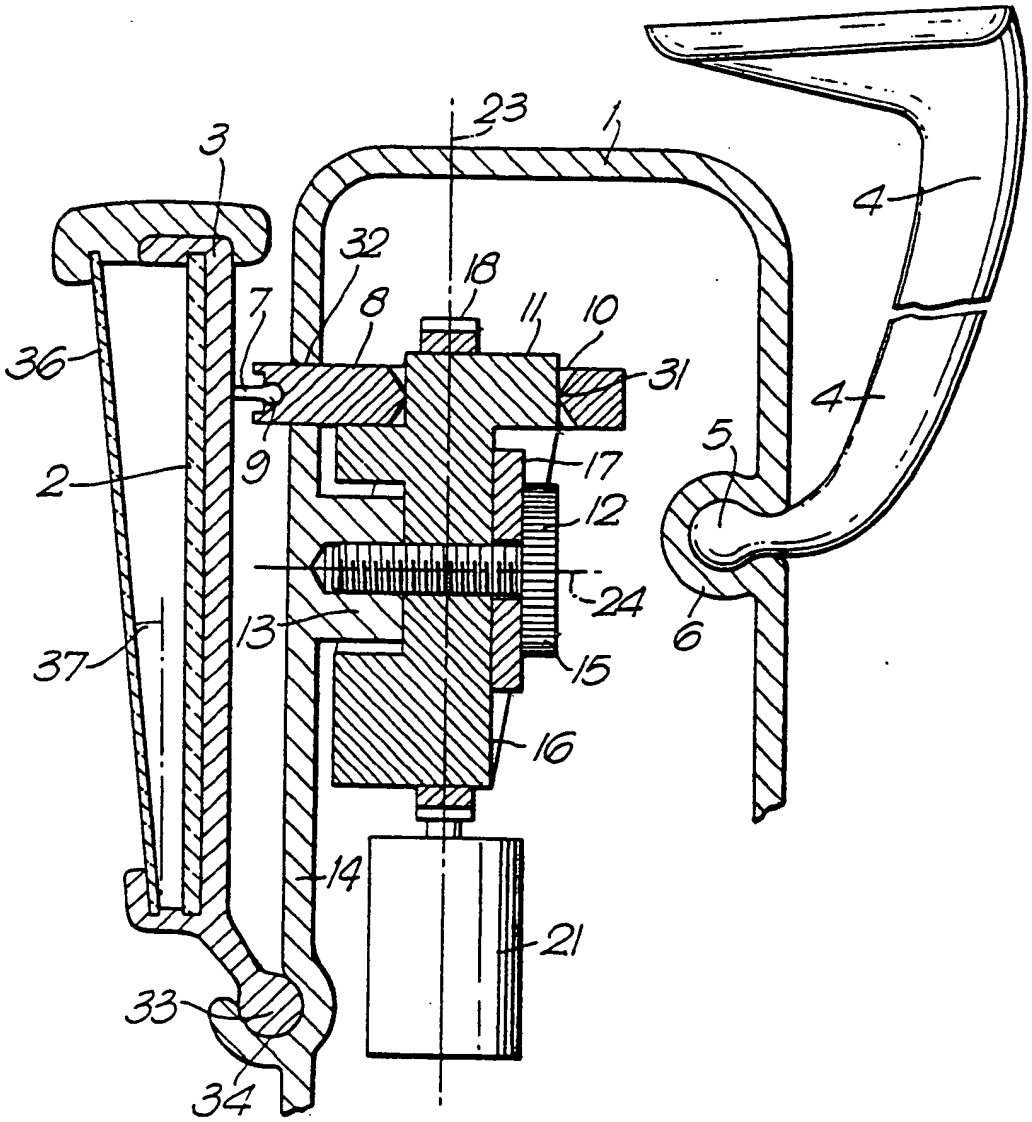


Fig.2.

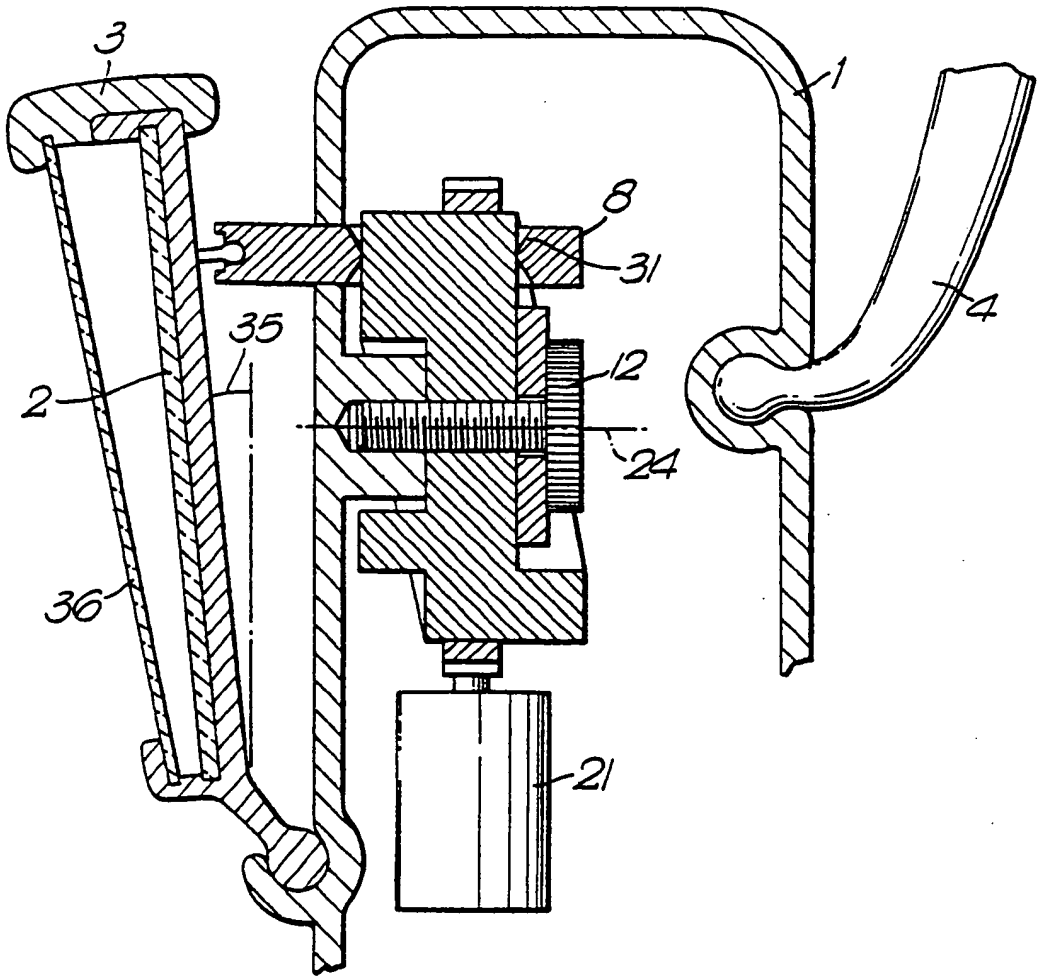


Fig.3

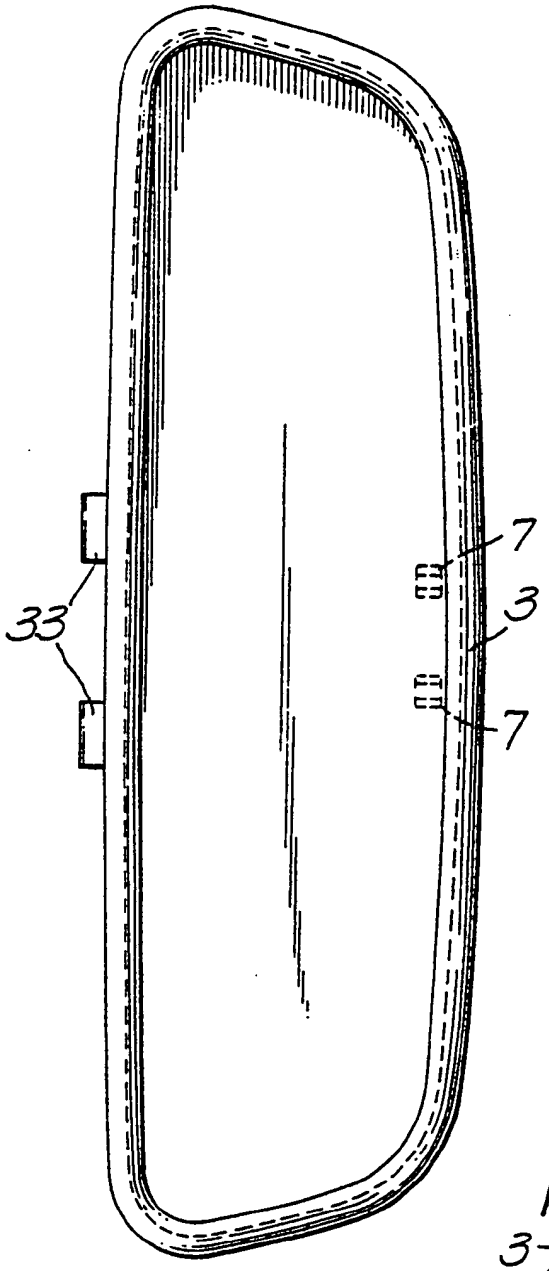



Fig.5.

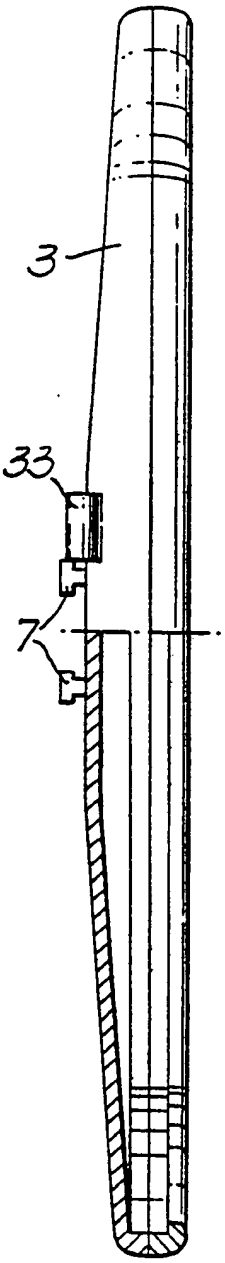



Fig.4.

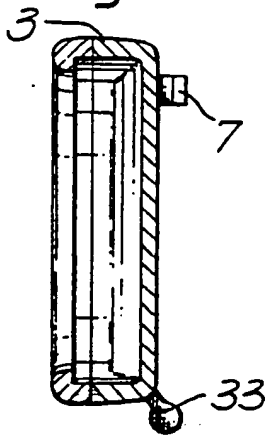


Fig.6.

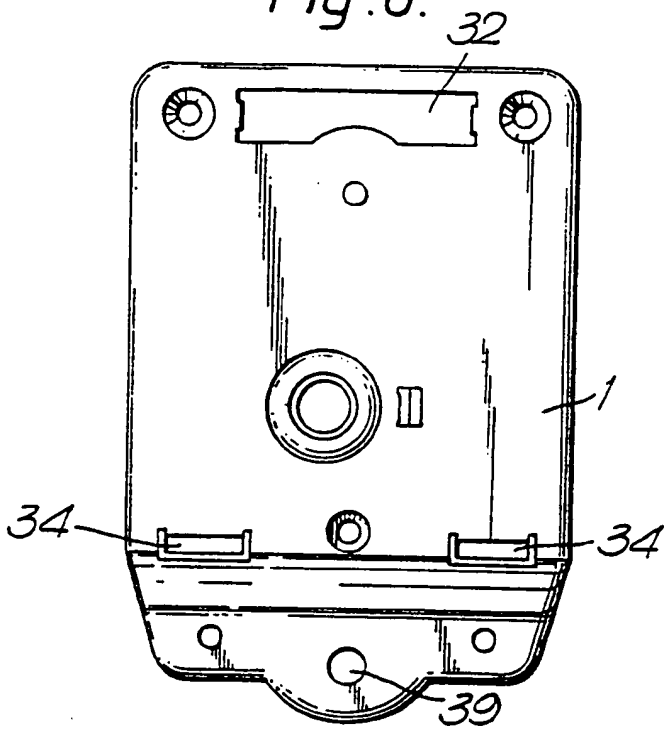



Fig.7.

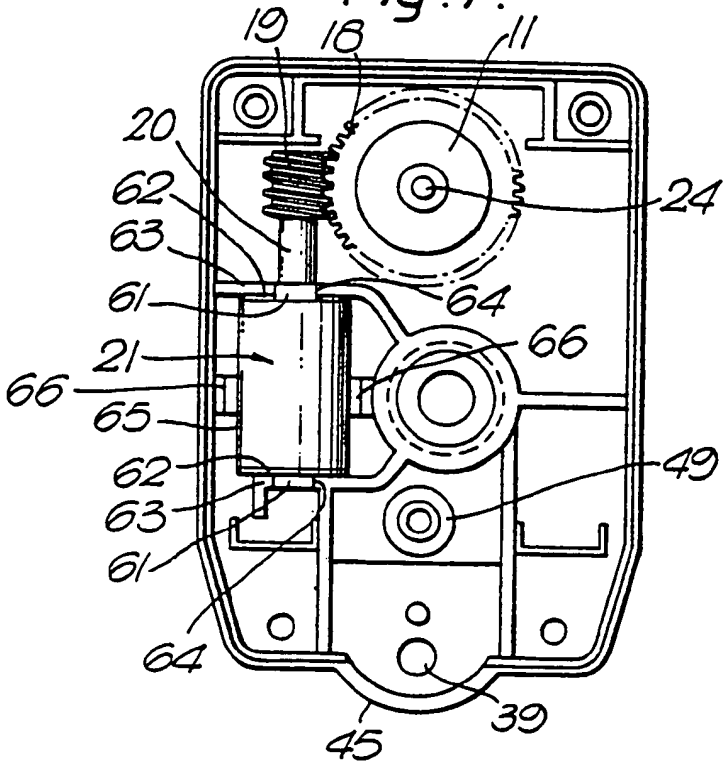


Fig.8.

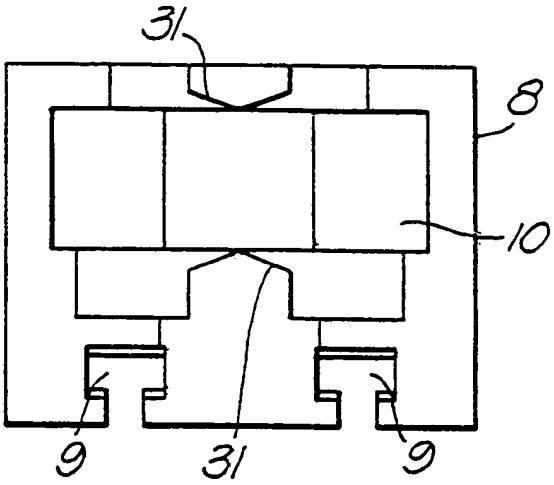



Fig.9.

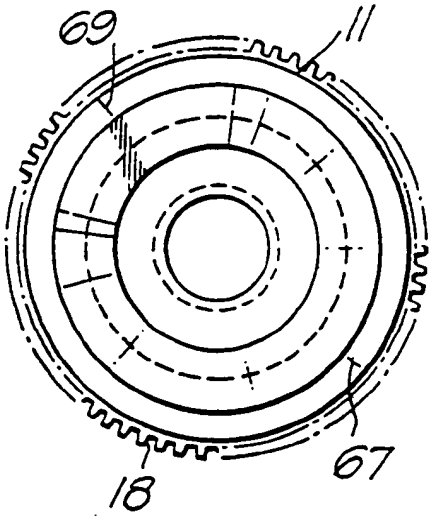



Fig.10.

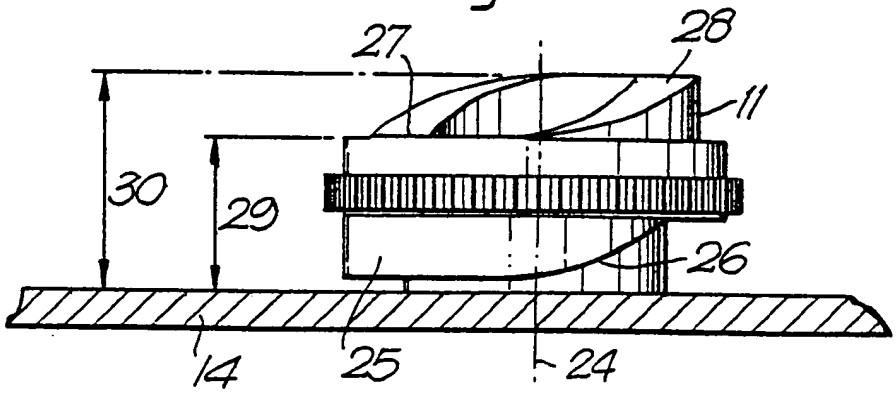
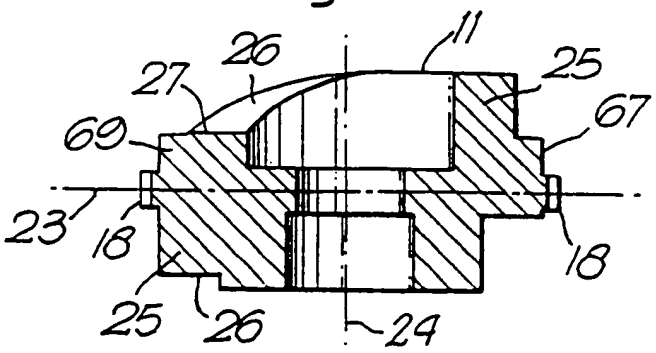
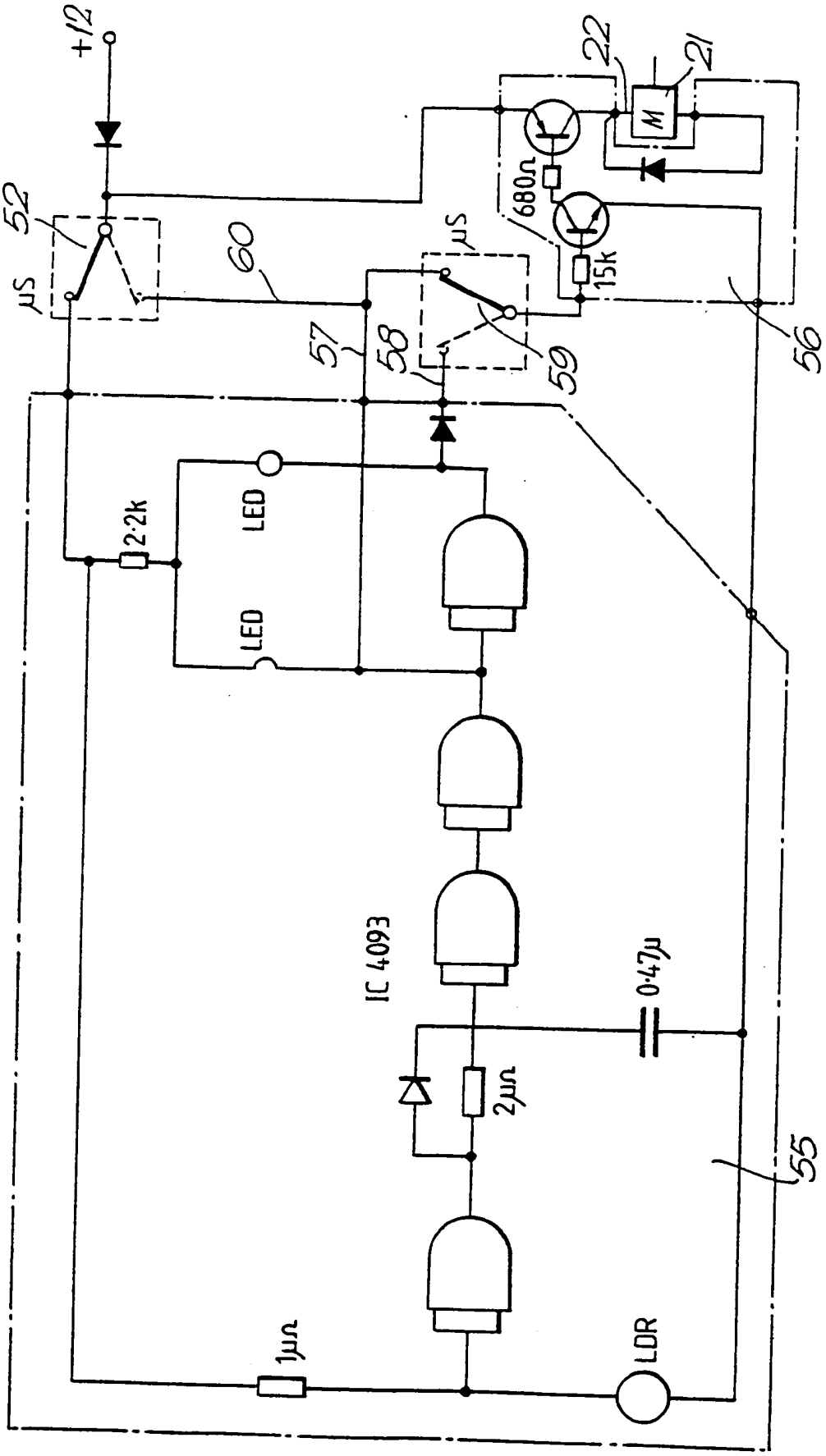



Fig.11.

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LDR
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Fig. 12.

Fig. 13.

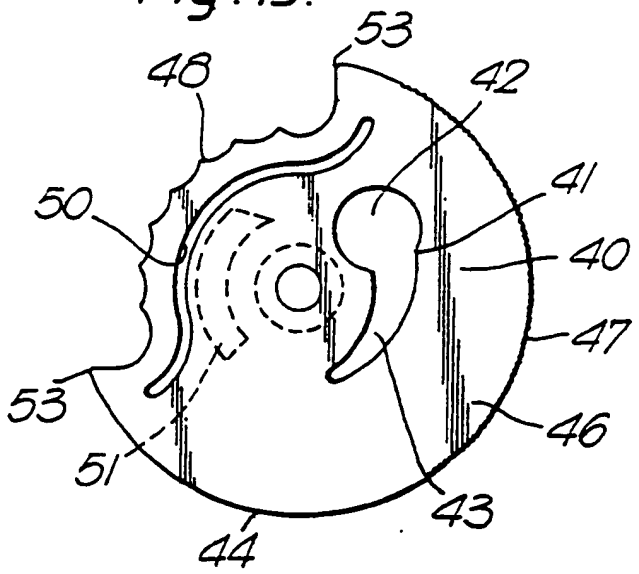



Fig. 14.

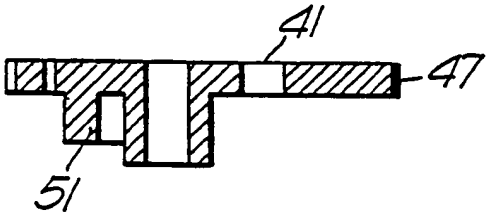
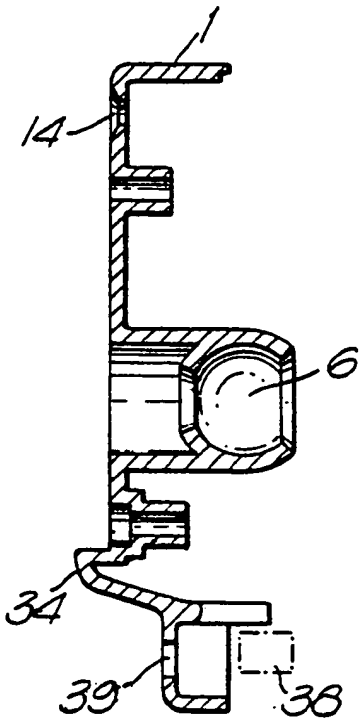



Fig. 15.



10.07.86

# Fitzpatricks

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OUR REF 35/58777/078 YOUR REF DATE 15 July 1986

Dear Sirs,

European Patent Application 86304746.0
Anthony Stewart

I can now confirm that I have attended to the payment of the fees in this case. A copy of the fee Voucher is attached.

As you will see an extra claim fee payment is included in respect of 23 additional claims. Actually 54 claims were present in the application as filed and I would be pleased if the following claims would now be cancelled (without prejudice) in connection with the novelty search procedure, namely claims 31 to 38, 40 to 42, 44, and 46 to 54, so leaving claims 1 to 30, 39, 43 and 45 (i.e. 33 claims in all). The following amendment requires to be made in claim 39 - delete "claim 31" insert claim 16.

I trust the claims will now be in order for the novelty search but please let me know if there are any objections

Yours faithfully,

J.W. Arthur
Representative

Enc

js

(19) Europäisches Patentamt
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(11) Publication number: **0 208 445**
**A3**

# (12) EUROPEAN PATENT APPLICATION

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(51) Int. Cl.⁴: B60R 1/08

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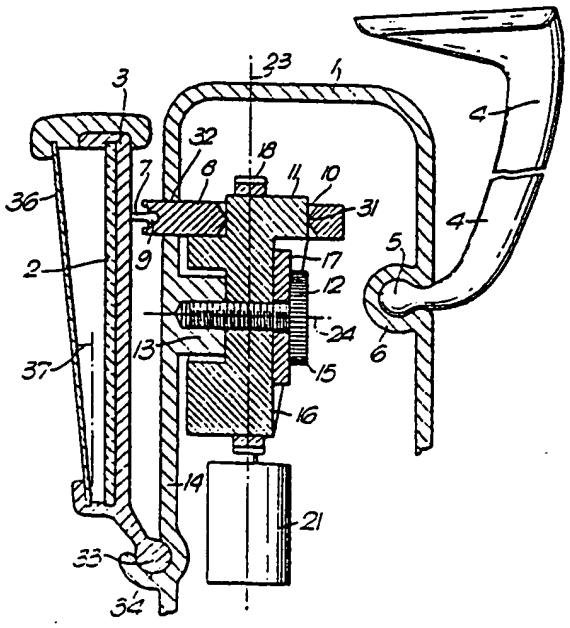
## (54) Rear view mirror.

(57) The present invention provides a rear view mirror for a motor vehicle which is automatically adjustable to prevent the effects of dazzle eg. by a vehicle approaching from behind at night. The mirror comprises an adjustable mirror surface (2) housed in a casing (3) and connected in an adjustable manner to an actuator (8) which engages an annular cam formation (26) having various cam profile heights whereby the mirror surface (2) can be adjusted by tilting. The cam formation (26) is part of a toothed wheel (11) driven by a small electric motor (21) the control circuit of which is actuated by a photosensor (38) so that mirror tilting is dependent on light intensity thresholds. The arrangement enables the various mirror adjustments to be achieved using uni-directional rotation of the motor and the toothed wheel (11) and this has the advantage of providing more reliable operation with less noise. The present adjusting mirror is also relatively inexpensive to manufacture.

Fig.1.




EP 0 208 445 A3

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number

EP 86 30 4746

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.4) |
|---|---|---|---|
| X | US-A-4 448 488 (NAKAHO)<br>* whole document * | 1-8 | B 60 R 1/08 |
| X | DE-A-3 147 281 (STEWART)<br>* whole document * | 1 | |
| A | DE-A-3 234 157 (STEWART)<br>* whole document * | 19,20 | |
| A | GB-A-1 422 411 (BALDWIN)<br>* whole document * | 1,9,10 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 60 R 1/00

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| BERLIN | 25-11-1987 | PETERS |

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